

Chemical curling (Super-Molecular Structural Modification or SMSM) of the fiber involves chemically treating the fibers with an intra-crystalline swelling agent that causes orientation changes to an amorphous region of the fiber, along with crystal lattice restructuring of a crystalline region of the fiber, or chain rearrangement. The SMSM treated fiber maintains substantially the same chemistry as an untreated fiber, but the morphology of the SMSM treated fiber has an affinity to curl. It is believed that SMSM chemical curling may convert some cellulose in the cellulose I form to cellulose II, which is known to be more thermodynamically stable than cellulose I.

SMSM treatment may be applied to fibers previously curled by mechanical means such as high-energy dispersion, steam explosion or high temperature heat treatment. Alternatively, SMSM treated fibers may be further curled by mechanical means prior to stabilization with a polymeric reactive compound.

Claim Rejections - 35 USC §112

The rejection of Claims 20-23 under 35 U.S.C. §112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicants regard as the invention is respectfully traversed.

Claims 20-23 are directed to a high wet resiliency curly cellulose fiber having a water retention value of at least 0.4 grams/gram, at least 0.5 grams/gram, at least 0.6 grams/gram, or at least 0.7 grams/gram, respectively. Applicants respectfully submit that these claims are fully supported in the specification. At Page 19, lines 15-17, Applicants disclose that “[T]he fibers of the present invention suitably have a WVR (defined at Page 9, line 9 as water retention value) of at least 0.4 grams/gram, or at least 0.5 grams/gram, or at least 0.6 grams/gram, or at least 0.7 grams/gram”. Furthermore, because the water retention value is an additional limitation not present in the independent claim from which Claims 20-23 depend, the indefinite article “a” preceding the term “water retention value” provides a proper antecedent basis for this limitation.

For at least the reasons given above, Applicants respectfully submit that Claims 20-23 are not indefinite. Accordingly, Applicants respectfully request reconsideration and withdrawal of this rejection.

Claim Rejections - 35 USC §102 and 35 USC §103

The rejection of Claims 1-4, 7-27, 30-52, and 54-75 under 35 USC §102(b) as being anticipated by or, in the alternative, under 35 USC §103(a) as obvious over U.S. Patent 5,834,095 to Dutkiewicz et al. is respectfully traversed.

Applicants note that the Examiner cited U.S. Patent 5,858,021 as issued to Dutkiewicz et al. In fact, U.S. Patent 5,858,021 is issued to Sun et al. Because the passages of the patent cited by the Examiner correspond with the Dutkiewicz et al. reference (U.S. Patent 5,834,095), Applicants presume the Examiner meant to cite U.S. Patent 5,834,095, which is issued to Dutkiewicz et al.

Dutkiewicz et al. discloses a process for treating cellulosic fibers using high temperatures that is effective to result in modified cellulosic fibers. After such heat treatment process, the treated cellulosic fibers will generally exhibit a desired level of stable curl.

For a reference to anticipate a claim, the reference must disclose each and every element or limitation of the claim. Dutkiewicz et al. does not disclose each and every element of Claims 1, 24 and 47. Applicants' invention as recited in independent Claims 1, 24 and 47 requires that the cellulose fibers be treated with an intra-crystalline swelling agent to chemically modify the fiber structure and be further treated with a polymeric reactive compound to create a high wet resiliency curly cellulose fiber.

Dutkiewicz et al. discloses that the use of high temperature alone can be sufficient to effectively modify cellulosic fiber such that the modified cellulosic fibers exhibit desired properties, particularly desired liquid absorbency properties (Col. 3, lines 34-38). In fact, Dutkiewicz et al. does not disclose anywhere that an intra-crystalline swelling agent may be applied to the fibers to chemically modify the fibers to induce curl nor does Dutkiewicz et al. disclose that a polymeric reactive agent may be applied to the modified fibers to stabilize the curl and provide the desired absorbency properties.

Dutkiewicz et al. does not disclose or suggest structurally modifying the cellulosic fiber by use of an intra-crystalline swelling agent to induce curl nor does Dutkiewicz et al. disclose or suggest stabilizing the curled fiber with a polymeric

reactive compound. In fact, Dutkiewicz teaches away from Applicants' invention in that Dutkiewicz et al. discloses that the process of the invention does not require the use of any additional additives to cellulosic fibers during the high-temperature treatment or any post-treatment steps after the heat treatment of the fibers to achieve the desired curls (Col. 6, lines 55-61). Furthermore, Applicants identify the process of Dutkiewicz et al. as being a proper pre- or post-treatment for the chemically structurally modified cellulosic fibers of the present invention (Page 11, lines 11-15). Thus, it would not be obvious to one skilled in the art reading the disclosure of Dutkiewicz et al. to chemically structurally modify cellulosic fiber via the use of an intra-crystalline swelling agent to induce curl, and to treat the modified fiber with a polymeric reactive compound to stabilize the curl to provide desired absorbency and high wet resiliency properties.

For at least the reasons presented above, Applicants respectfully submit that Claims 1-4, 7-27, 30-52 and 54-75 are not anticipated by, or in the alternative, obvious over Dutkiewicz et al. Thus, Applicants respectfully request withdrawal of this rejection.

Claim Rejections - 35 USC §103

The rejection of Claims 1-75 under 35 USC §103(a) as being unpatentable over U.S. Patent 5,137,537 to Herron et al. is respectfully traversed.

Herron et al. disclose individualized crosslinked fibers having a C₂-C₉ polycarboxylic acid crosslinking agent reacted with the fibers in the form of intrafiber crosslink bonds. Preferred crosslinking agents include citric acid.

Herron et al. does not disclose or suggest chemically treating cellulosic fibers with an intra-crystalline swelling agent to modify the super-molecular structure of the fibers, thereby imparting curl to the fibers. The fibers of Herron et al. are preferably mechanically separated prior to crosslinking such as by using a fluffing device so that the individualized fibers have imparted thereto an enhanced degree of curl or twist (Col. 7, line 66 – Col. 8 line 17). Alternatively, the fibers may be provided in a sheet form, before or after being contacted by the crosslinking agent, crosslinked and then individualized by mechanical means such as with a fiber fluffing apparatus or other methods of defibrating fibers known in the art (Col. 14, lines 28-42). In another method, the fibers may be mechanically separated into substantially

individual form between the drying and crosslinking steps (Col. 14, lines 62-64). Thus, in all cases curl is imparted to the individual fibers via mechanical means. Nowhere do Herron et al. disclose or suggest applying an intra-crystalline swelling agent to the fibers to modify the super-molecular structure of the fiber to impart curl to the fibers.

For at least the reasons given above, Applicants respectfully submit that the disclosure of Herron et al. fails to disclose or suggest Applicants' claimed invention. Accordingly, reconsideration and withdrawal of this rejection is respectfully requested.

Conclusion

Applicants believe that this case is now in condition for allowance. If the Examiner feels that any issues remain, then Applicants' undersigned attorney would like to discuss the case with the Examiner. The undersigned can be reached at (847) 490-1400.

Respectfully submitted,



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